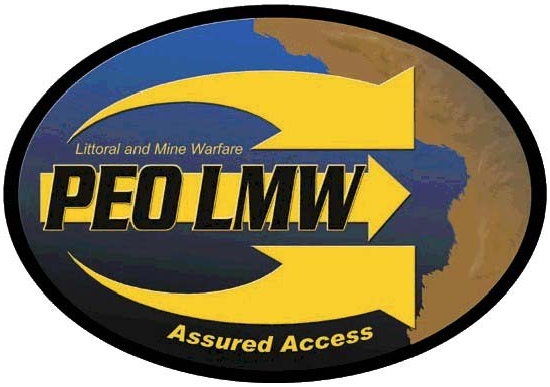
READ AHEAD PACKAGE
FOR THE
UNMANNED UNDERWATER VEHICLE NEUTRALIZER (UUV-N)
PROGRAM



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1. Introduction

This Read Ahead Package for the Unmanned Underwater Vehicle Mine Neutralizer BAA is part a multi-phase program to detect, classify and neutralize moored and bottom mines in the Very Shallow Water (VSW) environment using unmanned underwater vehicles (UUV). The goal of the Unmanned Underwater Vehicle for Neutralization (UUV-N) program is to enable VSW minefield neutralization of bottom and moored mines as a follow-on mission to Search-Classify-Map (SCM), and Reacquire-Identify (RI) UUV missions. The UUV-N will deploy with the NSCT-1 UUV platoon for Mine Countermeasures (MCM) operations in VSW objective areas.

The acquisition approach for the UUV-N Program is to field a capability that improves upon the baseline capability of divers and marine mammals as soon as possible, and to enhance the capability through a set of development spirals. The improvements expected in UUV-N capability with each spiral are that the operational reliance on diver- and mammal-based systems will be reduced in environments suitable for employment of the UUV-N capability, and the ability to operate in more restrictive risk directives is increased. Operational timelines for lane preparation will be increased, and the number of lanes capable of clearance by NSCT-1 assets will be increased. The UUV-N effort will contribute to, and benefit from, a variety of technological enhancements underway for unmanned systems.

2. General Description of Operational Capability.

a. Mission Area. The "U.S. Naval Transformation Roadmap: Power and Access…From the Sea" emphasizes the need for ship-to-objective maneuver in support of sea strike transformational capabilities, and mine countermeasures in support of sea shield transformational capabilities. A family of unmanned underwater vehicles (UUVs) for persistent intelligence, surveillance and reconnaissance (ISR) are considered fundamental to the transformation. Navy operational concepts require seamless maneuver and coordination of forces. A basic tenet of this operational maneuver is that Naval and amphibious operations will be conducted where the enemy's coastal defenses, including sea mines, are the weakest. Prior to an operation, the Mine Warfare (MIW) Commander is tasked to quickly assess the extent of the sea mine threat and to determine the condition of the shallow water approach. He must be able to make informed decisions on mine/obstacle avoidance and/or the efficient utilization of clearance assets. To this end, Naval forces must possess mine exploration and reconnaissance capability, which includes locating gaps in or around suspected minefields. This capability will be provided by employing dedicated (supporting) Very Shallow Water (VSW) Mine Countermeasure (MCM) forces within the Naval Special Clearance Team ONE (NSCT-1) comprised of unmanned underwater vehicle (UUV), marine mammal system (MMS), and diver platoons. These VSW MCM forces provide the capability of mobilizing an exploration force on advanced platforms in support of amphibious task force (ATF) operations.

This VSW MCM force employment concept advocates alternatives to "man-in-the-minefield" systems as the desired approach to mine countermeasures in the VSW region. Consistent with this concept, investments in VSW MCM capabilities are aimed at exploring the use of UUVs. UUVs will not be employed in the immediate vicinity of the objective area simultaneously with divers and MMS. UUVs will be used in advance of these forces to optimize accomplishment of the total VSW MCM mission. The requirement for such a capability is provided in the Mission Needs Statement (MNS) for Shallow Water MCM (Approved Feb 92). Based upon this requirement, a Cost and Operational Effectiveness Analysis (COEA) for the Naval Special Warfare Mine Countermeasures (NSW MCM) Program (April 1994) was developed. This report outlined the results of a broad-based alternatives analysis to ascertain the best approach for correcting long-standing VSW MCM capability deficiencies. This study concluded that divers equipped with improved systems, specially outfitted marine mammal systems, and small, unmanned vehicles were the most effective and suitable systems for accomplishment of the complex VSW MCM tasks. In response to these findings and in support of the Navy Investment Strategy for Development of Unmanned Underwater Vehicle Systems dated 29

April 1999, the concept of a single UUV was examined to conduct search-classify-map (S-C-M), reacquire-identify (R-I), and neutralize (N) missions in the VSW. These tasks proved too complex for a single UUV and the decision was made to use separate vehicles for the S-C-M, R-I, and N missions. Analyses of Alternatives (AoA) have been completed on the S-C-M UUV, the R-I UUV, and the UUV-N. Requirements generation for the S-C-M UUV and the R-I UUV is complete. The UUV-N AoA goal was to specifically examine alternatives for satisfying the requirements for a small UUV that would be capable of delivering neutralization charges in the VSW zone. The primary focus of the first generation UUV-N was to neutralize bottom and moored mines. The AoA determined that the best cost/benefit approach to fulfilling the UUV-N requirements was to identify two or three potential candidates and evaluate them in a demonstration series.

b. Type of System Proposed. The VSW MCM system for Neutralization (hereafter referred to as UUV-N) will be comprised of five major subsystems:

(1) Hull, Mechanical and Electrical (HM&E). The HM&E comprises the hull, power, propulsion, and interface components that deliver the neutralizer within kill range of the target mine.

(2) Neutralizer. The neutralizer subsystem comprises the neutralizer and firing system and is the means by which the mine is rendered inoperable. It may be an explosive (point or bulk charge), influence, or other type.

(3) Navigation. The purpose of the navigation subsystem is to provide precise navigation to designated wait positions and estimated target coordinates.

(4) Remote Communications. This subsystem receives remote command signals for navigation and firing sequence initiation instructions. It may also contain a transmitter for remote signal transmission back to the operational craft (e.g. target acquired, in-position, armed).

(5) Target Sensor & Solution Software. Close-in targeting equipment and a firing solution algorithm are included in this subsystem.

The first generation UUV-N system will be capable of performing low visible neutralization of previously identified bottom targets in the VSW zone (10 to 40 feet sea water (FSW)) in support of amphibious landing and mine countermeasures operations. The vehicles will each be two-person portable in size and employed by the VSW MCM UUV Platoon with the NSCT-1. The UUV-Ns will transit to pre-programmed positions of previously reported and precisely mapped mines to deliver neutralization charge.

c. Anticipated Operational and Support Concepts.

(1) Operational Concept. The UUV-N will deploy with the VSW MCM UUV platoon for advance force and pre-assault MCM operations in VSW MCM objective areas. Depending on the operating environment, a combination of S-C-M UUV, R-I UUV, and marine mammal systems will be assigned to conduct exploratory and reconnaissance MCM search and identify operations in the VSW zone. Through integrated employment of these assets and fusion of data from other sources, a list of geographic coordinates of the mines to be neutralized by the UUV-N will be generated. A mission plan will be developed in which UUV-Ns will be pre-programmed to maneuver from an assigned launch point and deliver the neutralization charges to the targets on the list. NSCT-1 platoons will insert from the ATF via a small craft (insertion/extraction craft). The combat load of the UUV-N deployed neutralization charges will be at least four per sortie. The small craft with the UUV-Ns will transit to a staging point seaward of the objective area, where the UUV-Ns will be placed in the water to begin its ingress to the objective area. The UUV-N will deliver neutralization charges to each mine to be remote- command detonated prior to fleet mobilization. Following neutralization, re-useable items (RF/ processor buoys, data links, etc) will be retrieved and the team will extract to the host ship.

(2) Support Concept. A systems engineering approach will be employed to ensure the proper mix and type of contractor/government support. The establishment of a Navy organic depot repair capability is not anticipated due to the limited number of fielded items. The extent to which the manufacturer will be utilized for supply support, configuration management, in-service support, and depot maintenance will be determined by a system logistic analysis. Specific system support planning actions will be defined in a system program plan.

3. Threat.

a. Threat Overview and Projected Threat Environment. The threat from naval and anti-invasion mines and obstacles is briefly described in Office of Naval Intelligence (ONI) Production Requirement TA-015-02 dated June 2002. A more detailed description of potential minefield models and mine types, which might be employed by adversaries to counter amphibious operations, is contained in ONI SABERCUT 03-99. These references identify various mine types, minefield spacing and planting depths likely to be used in the VSW and surf zone (SZ) mine/obstacle fields. A variety of mines ranging from crude moored contact mines to sophisticated bottom influence sea mines, obstacles, anti-invasion, and land mines could be employed to defend against and impede an assault from the sea. Mines and obstacles employed to counter an amphibious assault can vary widely with the inventory and ingenuity of the minefield planner. In general, small sea mines, (both moored contact/influence and bottom influence) are likely to be used in belts in the shallow water zone, and well into the VSW zone. Bottom mines, being designed with increasingly stealthy shapes that are susceptible to burial in the near shore environments, further complicate the MCM task in the VSW zone. In the shallower portions of the VSW zone and in the SZ, smaller anti-invasion mines and/or obstacles in greater densities are likely. Anti-tank and anti-personnel mines and more obstacles are likely near the shoreline.

4. Shortcomings of Existing Systems.

a. General. Low visible systems used to perform VSW MCM missions in the amphibious assault landing area have many limitations. The S-C-M UUV and R-I UUV will provide the first systems that do not require personnel to operate in the minefield during minefield operations. With the exception of the S-C-M UUV and R-I UUV, all other existing systems that are employed for the VSW MCM mission require a “man-in-the-minefield” approach to the mission and suffer the following deficiencies:

- High risk to personnel/marine mammals
- Low area search rates
- Susceptibility to environmental conditions, e.g. sea state, turbidity, and surge, which limit the operational coverage of existing systems
- Large shipboard footprint requirement and logistic support burden
- Inability to safely operate during daylight hours

Other dedicated MCM Systems are effective in achieving their mission in deeper water and permissive environments, but are not capable of meeting the mine threat in all tactical situations for VSW depths. There are also a number of organic (assigned) MCM systems being developed for forward-deployed forces to provide for early MCM operations. These systems include airborne electro-optics and improved mine hunting sonars. The most significant aspect of these systems in the VSW zone is their vulnerability to hostile fire due to their design as overt systems requiring a permissive environment.

The Concept of Operations for Development and Employment of operational VSW MCM forces, now assigned within the NSCT-1, calls for the establishment of a baseline capability with diver and marine mammal systems, and then a transition to unmanned systems as soon as enabling technology

is developed. Past studies have consistently concluded that, aside from divers and marine mammals, no other in-service systems are adequately suited today for the conduct of pre-assault VSW MCM missions. Since initial investment in the VSW MCM concept, the Navy has made considerable progress in achieving basic capabilities with divers and marine mammals for employment in many VSW environments. The S-C-M UUV will provide the unmanned capability to map mine-like contacts and the R-I UUV will identify which of these mine-like contacts are mines and generate a list of their geographical co-ordinates, these vehicles are not equipped to perform the neutralization mission.

b. Neutralization. There are currently no appropriate VSW neutralization systems that do not require a "man-in-the-minefield". Current neutralization systems in service in the VSW are delivered by divers and/or mammals.

The systems used by divers to initiate explosives and explosive actuated tools underwater place the diver at unnecessary risk by requiring initiation of a time fuze/other delay while still in the ordnance kill radius. The preparation of existing systems for detonation requires extensive handling and manual rigging by personnel, both on the surface and underwater. These preparations further degrade diver operational safety, requiring excessive time in the minefield and imposing more cumbersome material handling procedures for the divers and topside personnel. The effectiveness of current neutralization techniques utilized by divers is often degraded by uncontrollable factors. Positive control of the exact time for detonation is not possible. Additionally, the long lengths of detonating cord and floating initiators required by existing systems are also susceptible to environmental factors such as strong or shifting currents and high sea states. The likelihood of misfires and undesired movement of the explosive charge from its required position on the sea floor increases with degrading weather conditions. The ability of the neutralizer to hold station in neutralization position against the various threat mines in the VSW environment is a major consideration in the VSW Neutralization Task. Finally, when conducting multiple detonations in close proximity to each other, the accuracy of current diver time delay systems is inadequate to ensure simultaneous detonations. The first detonation can render other detonation systems ineffective.

Vulnerability of the marine mammal systems is also a key shortcoming. The operations craft is required to accompany the dolphin through the minefield, operating in effect as a very small surface mine countermeasures vessel (dolphin functioning as both the sonar and the neutralization charge deployment subsystems). New neutralization charges compatible with the VSW physical and operating environment are being provided for MMS.

5. Capabilities Required.

a. System Performance.

(1) Mission Scenarios. The UUV-N will be used to reacquire and neutralize previously identified mines in the VSW zone. The VSW zone extends from 10 - 40 fsw. Tactical integration of the UUV-N with S-C-M and R-I UUVs and with VSW MCM diver and MMS platoons will be accomplished to achieve the assigned MCM objective in the most efficient manner. A UUV Platoon sortie is defined as departure from the ATF host ship, action on objective (deployment or actuation), and return to the host ship. A typical mission scenario for the UUV-N is described below.

Prior to Deployment: The UUV-N System will be stored in a covered storage area. Qualified operators will perform the majority of Organizational-Level (O-Level) maintenance in designated workshops. Pre-operational inspections will be performed prior to tasking, packing, and transport to the deployment area.

Theater of Operations: The operators will program the geographic co-ordinates of previously identified mines for neutralization. After pre-mission check, the UUV-N will be loaded on a small craft for transport to the launch site to perform the neutralization mission.

On-Site: Mine neutralization devices will be placed at or near the mines. At the time of the Commanders choosing, an actuation signal will be given to neutralize the mines, or the signal may be given to approach the mines and then neutralize them. Actuation of the mine neutralization devices may require an additional sortie after placement, unless over-the-horizon actuation signal transmission can be achieved. The UUV-N full mission profile is contained in Section 10.

Post-Operation Analysis: Upon return, the deploying vessel will be recovered along with the UUV-N (if it is not expendable) and post mission analysis and maintenance checks will be conducted.

(2) System Performance Parameters. UUV-N performance parameters are delineated in Table 2 and are based on mission goals per sortie. The sortie was used as a basis for the performance goals because individual subsystems/configuration have yet to be identified. It was determined to be better at this time to state the performance goals at the operational mission requirement level versus performance as a driver by subsystem.

Table 2. UUV-N System Performance Goals

KPP	System Parameter	Threshold	Objective
X	Neutralization effectiveness [Note1]	0.72	0.95
X	Reliability [Note 2]	0.90	0.95
	Vulnerability [Note 3]	Qualitative parameter, vulnerability characteristics must support mission accomplishment	
	Low Visibility	No continuous visible profile above the water surface	
	Station Keeping Time (SS3) [Note 4]	TBD	7 days
X	Interoperability [Note 5]	Qualitative parameter, interoperability characteristics must support mission accomplishment Interface with COIN	
	Command and Control [Note 6]	Remote command launch and/or enable functions	Remote launch/ enable commands and Operational feedback from UUV-N
	Portability/Deployability [Note 7]	2 men	2 men
X	Availability (A_o)* [Note 8]	0.85	0.95
	Compatibility with NSCT-1 Support Structure [Note 9]	Qualitative parameter, compatibility characteristics must support mission accomplishment	
	Maintainability (MCMTOMF) [Note 10]	5 hours	2 hours
	Target Types [Note 11]	All mines in VSW regime	All mines in VSW regime
	Sortie Combat Load [Note 12]	4 bottom mine neutralization charges*	8 bottom mine neutralization charges*
	Permissible On-Station Time [Note 13]	2.5 hours	15 to 30 minutes

	Compatibility with Physical Environment [Note 14]	See Table 4

X Indicates key performance parameter
**** May change to include bottom and moored mines pending requirements review***

Note 1: Neutralization Effectiveness = $\frac{\text{Number of successful neutralizations}}{\text{Number of intended neutralizations}}$

Neutralization effectiveness is the probability that the system will neutralize a target mine deploying one neutralizer against that target. It includes the following functions:

- Precise reacquisition of target
- Precise placement of neutralization charge
- Neutralization charge station keeping during wait time
- Detonation as intended (on command)
- Destruction of target by neutralization charge when it functions as intended

Note 2: Reliability is defined as the duration or probability of performance under stated conditions (Mission Reliability (R)) without an operational mission failure (OMF). Failures that delay the mission activities for more than 2 hours are OMFs. Compute as reliability point estimate (R).

Note 3: Vulnerability is defined as the characteristics of a system that cause it to suffer a degradation (loss or reduction of capability to perform the designated mission) as a result of having been subjected to a certain (defined) level of effects in a hostile environment. Vulnerability is considered a subset of survivability. It includes:

- Susceptibility to compromise due to inadvertent detonation
- UUV/Personnel detection by enemy
- Susceptibility to neighbor charge or nearby mine detonations

Note 4: Station keeping time is the time between placement of neutralization charge in the minefield and detonation to neutralize the mine.

- If static charge, must hold station in neutralization position until detonation
- If target seeker, must remain in position to reacquire target on command

Note 5: The UUV-N shall be compatible with the following NSCT-1 equipment:

- Underwater Information System (UIS) and MK 8 Navigation & Mapping System
- EOD common operator interface
- Existing firing devices
- UUVs already at NSCT-1
- Physical interfaces with operating craft and insertion/extraction craft
  Communications interfaces

The UUV-N may be required to interface with Common Operator Interface (COIN). The UUV-N information flow, between Navy only components, is provided in Table 3.

Note 6: Command and control functions necessary or desirable to accomplish the mission include:

- Remote command launch and/or enable functions
- Remote launch/enable commands
- Operational feedback from UUV-N: Report: 1) Start mission sequence, 2) Target Reacquired, 3) Enabled, 4) Armed (target solution satisfied, ready-to-fire)

Note 7: Portable for load-up and deployment.

Note 8: Availability is defined as the number of times the UUV-N is available divided by the number of times the UUV-N is required to perform a mission.

Note 9: Compatibility with the following NSCT-1 characteristics:

- Ashore and Afloat footprint constraints
- Manpower, Personnel, and Training
- Number of personnel required to operate

Note 10: Maintainability is defined as the Mean Corrective Maintenance Time for Operational Mission Failures (MCMTOMF) and is the total number of clock hours of corrective, on-system, active repair time which is used to restore failed systems to mission capability status after OMFs occur divided by the total number of OMFs (OMFs are defined in Note 2 above). Corrective maintenance is the organizational level repair time during which one or more personnel are repairing a UUV-N and includes preparation, fault location/isolation, correction, adjustment / calibration, and follow-up check out time.

Note 11: Target Types includes the types of mines against which UUV-N will be effective.

Note 12: Sortie Combat Load is the UUV-N system (s) equipped with at least 4 neutralization charges. Sortie is defined as UUV Platoon leaving from and returning to the stern gate to deploy or actuate the UUV-Ns.

Note 13: Permissible On-Station Time or the Maximum Time to Deploy is defined as the time required for UUV-N operating team to deploy four UUV-Ns at staging area near minefield.

Note 14: Compatibility with Physical Environment parameters are included in Table 4.

b. Information Exchange Requirements. No top level IER matrix is needed because the UUV-N will require information flow between Navy only components. Table 3 is not an IER matrix but is provided in IER matrix format to document the information flow required for the UUV-N.

Table 3. UUV-N Information Flow

Rationale UJTL#	Event	Info Char	Sending Node	Receiving Node	Crit	Format	Timeliness	Class	Remarks
OP 2.2.5*	Receive target locations	Situational Awareness – Minefield Data	R-I UUV recon & target location info: COIN Input	UUV-N Navigation sub-system	Y	Geodetic or Absolute Reference	Pre-mission	S**	Input from R-I UUV via OIC to provide target coordinates
OP 3.2.5*	Receive acquire / enable signal	Signal for UUV-N to acquire / neutralize target	UUV Platoon remote firing system transmitter	UUV-N Command and Control and Neutralizer sub-systems	Y	Acoustic or Magnetic	During mission	S**	Signal from firing system transmitter for UUV-N to actuate or approach target and then actuate.

* Tasks are modeled after operational tasks provided in UJTL and UJTL task number is used
**Data may range in classification up to a level of Secret due to operational security concerns.

c. Natural Environmental Factors. The environmental parameters for the UUV-N are described in Table 4. The UUV-N must also operate satisfactorily after being exposed to shock,

vibration, snow, wind, rain dust, and sea spray that may be encountered during storage, transportation, and operation.

d. Logistics and Readiness. Operational availability and corrective maintenance thresholds are provided in Table 2. The requirement for subsystem test and failure isolation will be determined as the system design progresses. It is not anticipated that wartime logistics support will be significantly different than that planned for peacetime operations. There are no unique combat support requirements identified.

Table 4. Operational Environment Parameters

System Parameter	Threshold	Objective
Sea State (Note 1,2)	≤ 3	3
NWP 3-15 Bottom Category (Note 3)	B - 1	C - 1
Current (kt)	2 kt	4 kt
Air Temperature (° F) (not direct sunlight)	0° to 125°	
Water Temperature (° F)	33° to100°	29° to 105°
Water Depth (fsw)	10 - 40 fsw	10 - 60 fsw
Over-The-Horizon (OTH) Transport distance from ATF to Drop off (nm)	26 nm	
Volume of Mine that can be buried and still be considered a valid target (%)	TBD	TBD
Transit distance from drop off to minefield	500 yds	5 miles

Note 1: Sea State 3 is defined as wind velocity of 11-16 knots with average wave height of 3 feet.

Note 2: UUV-N will be subject to rip currents and vertical orbital velocities induced by shallow water waves close to the surf zone. Further characterization of this environment is a subset of this BAA

Note 3: Bottom Type B-1 is defined in NWP 3-15. The B refers to the Bottom Category and the 1 refers to the Clutter Category.

e. Other System Characteristics. The UUV-N System must be capable of being deployed and recovered from a small craft (i.e., RHIB or CRRC), and operated, in a wide range of environmental conditions and varied sea states. Communication, information, and physical and operational security needs will be consistent with NSCT-1 COMSEC, INFOSEC, and OPSEC procedures for assigned VSW MCM forces. There is no requirement for the UUV-N to be Nuclear, Biological, and Chemical Contamination (NBCC) survivable.

6. Program Support.

a. Maintenance Planning. Organizational and depot level maintenance is the current planned maintenance concept. VSW MCM UUV platoon members will perform organizational level (O-level) preventive and corrective maintenance. A Level of Repair Analysis (LORA) will be performed to determine the appropriate level of contractor-supported depot level maintenance.

b. Support Equipment. Any identified support equipment requirements above the O-level will be examined for compliance with Consolidated Automated Support System (CASS) capabilities to ensure no redundancy.

c. C^{4}I/Standardization, Intelligence and Commonality. The UUV-N system will neutralize mines. The UUV-N will require information flow between Navy only components. C^{4}1 standards are defined under interoperability (see Note 5).

System configuration must allow for insertion/extraction in a VSW MCM platoon small craft (i.e., RHIB/CRRC) configured to support transport of an operationally configured system with auxiliary equipment and associated operator personnel. The UUV-N navigation system will be compatible with navigation and target position data generated by the S-C-M UUV and R-I UUV systems and divers and will not degrade existing VSW MCM systems

d. Computer Resources. Software and hardware interface requirements will be identified in the UUV-N system performance specification. All necessary documentation will be generated to operate and maintain both the hardware and software computer resources.

e. Human Systems Integration. Human Factors Engineering will be used in the design of all hardware, software, operational and maintenance procedures, tools, and support equipment. Emphasis will be placed on use in the projected operational environment (i.e., small boats in rough seas). Specifically all controls, displays, and equipment shall be operable across the full range of temperatures, ambient lighting conditions, and user-worn equipment including clothing, life jackets, gloves, and NBCC protective gear. Equipment preparation including data upload, post mission data download, and decision making aids shall be compatible with user's knowledge, skills, and abilities. Each UUV-N must be two-person portable. Initial training will include instruction on O-level maintenance procedures and operations training. Following the completion of this course, UUV platoon personnel will participate in continuous exercises, which shall constitute on-the-job training as part of the job qualification requirements (JQR) process. Following successful completion of the UUV-N system course of instruction and the JQR program, personnel will be qualified to operate the UUV-N system.

f. Other Logistics Considerations. Configuration Management, Reliability and Maintainability, Safety, and Quality Assurance will be integrated into the ILS development.

g. Transportation and Basing. The UUV-N system can expect to be transported by civilian or military aircraft/helicopters (pressurized and non-pressurized to transport altitudes up to 39,000 feet), by land, over road and rough terrain, by truck or jeep, and aboard ship. Explosives will be handled via the existing approved EOD explosive shipping and handling process. Shipboard footprint of the UUV-N system combined with ancillary support equipment, consolidated for shipboard storage, will fit into an 8' X 8' X 20' MILVAN or equivalent deck space size. All applicable EOD and VSW MCM explosive procedures will be followed. Support equipment required to operate/maintain the UUV-N system can be transported/utilized onboard any amphibious host ship.

h. Geo-Spatial Information and Services (GI&S). The UUV-N system operators will use MEDAL/GCCS-M and COIN as a mission planning tool, and will have access to standard NIMA chart products, specialized Mine Warfare and METOC data bases, and METOC products through MEDAL's compliance with defense standards. The system operators will use the World Geodetic System - 1984 (WGS-84) as a datum standard and conform to other Positioning, Navigation, and Timing guidelines from the Joint Technical Architecture and CJCSI 6130.01B.

i. Natural Environmental Support. The UUV Platoon Officer-in-Charge (OIC) will receive tactically significant METOC warnings that may restrict VSW MCM operations Time-sensitive environmental data collected by the system will be reported by the UUV-N system operators. Specialized oceanographic data including tides and currents will be measured on scene or obtained from OIC.

7. Force Structure. A dedicated VSW MCM UUV Platoon within the NSCT-1 will be maintained to provide a sustained core contingency capability.

8. Schedule.

a. Initial Operational Capability (IOC). IOC will be achieved when the following actions have occurred:

(1) The VSW UUV Platoon within the NSCT-1 is equipped with one complete validated UUV system.

(2) The UUV-N system logistic support infrastructure is in place to meet basic supportability requirements

b. Full Operational Capability (FOC). FOC will be achieved when the following actions have occurred:

(1) NSCT-1 has been equipped with the approved allowance quantity of UUV-Ns.

(2) UUV-N system logistic support infrastructure is fully in place.

c. Future Improvements. Pre-Planned Product Improvements (P^3Is) will be initiated after the production decision to introduce the following improvements:

(1) Systems that enhance mine reacquisition. This may include advance sensors and/or data fusion of multiple sensors for reacquisition and identification of mines including buried targets.

(2) Advanced two-way communications capabilities: The advanced two-way communications capability will enable the UUV-N system to reliably transmit and receive larger quantities of near real-time data at extended ranges.

(3) In-mission User Redirect and Self-Direct capabilities: These will enable the UUV-N to be diverted to alternative pre-programmed mission targets on command or on detection of specified pre-programmed criteria.

(4) Extended range standoff: The extended range standoff (greater than 5nm) will enable the UUV-N to autonomously ingress from the command and control station to the objective area, and conduct objective area tasks.

(5) Advanced Navigation Capability: An advanced navigation capability will improve navigation range, accuracy, and/or repeatability; reduce explosive load requirements, and enable baseline establishment without requiring personnel to place transponders or eliminate the need for a baseline system.

(6) Advanced Vehicle Propulsion: Improvements in vehicle propulsion systems will allow the ability of the UUV-N to maneuver, or even hover, to allow improved neutralization charge delivery.

(7) Improved Neutralization Station Keeping will enable the neutralization charge to stay in its intended position for up to 30 days.

P^3Is will be affected as engineering changes to the UUV-N system. Program plans for these P^3Is will be developed after the production decision.

9. CONOPS

a. NSCT-1 Non-Permissive CONOPS

The NSCT-1 non-permissive CONOPS comprises five basic operational phases, as described in Table 6.

Table 6. NSCT-1 Full Mission Profile for Non-Permissive Operations

Phase	Action Conducted During Phase
Insertion	Operating team leaves host ship in insertion/extraction craft with escort. Proceed to a rendezvous point where the operating teams and operating craft are disembarked. Rendezvous point is normally at shoreward edge of the permissive environment. Insertion/extraction and escort craft will normally remain at rendezvous point for operating team pick-up or assistance.
Infiltration	Operating teams infiltrate into the non-permissive objective area. Strict security and operational discipline restrictions are in effect. Escape, evade, and rescue plans are in effect.
Action on Objective	Upon reaching the objective area, operating teams deploy personnel and equipment to conduct the assigned mission.
Exfiltration	Operating teams reassemble to proceed to the rendezvous point, all discipline restrictions, and contingency plans are in effect until reaching the rendezvous point.
Extraction	Operating team personnel, craft, and equipment are recovered aboard the insertion/extraction craft. Insertion/extraction craft returns to host with escort.

The following are key factors in non-permissive MCM operations success.

- Deception – Concealment of the operational commander's intent, or misleading opposing forces as to the commander's intent
- Night Operations – Cover provided by darkness is a key concept of non-permissive operations
- Minimized Time in Proximity to beach – Reduces time available for opposing forces to detect operating teams
- Environmental Considerations – tides, moonlight, weather conditions, sea state affect observability
- Endurance – system endurance limitations affect time allocated to conduct mission
- MCM Commander's instructions
  - Risk directive – [1] MCM risk directives establish mission priorities and set levels of acceptable risk for MCM operations.
  - Desired clearance level – Affects required time-on-station.

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[1] Risk directives are usually set by the on-scene amphibious task force commander in view of the operational phase and urgency of a particular point the operational schedule. MCM risk directives are defined as:

- Risk Directive ALPHA: Primary concern is to minimize risk to the MCM assets. Timely completion of the task is of secondary importance.
- Risk Directive BRAVO: Balance between risk to MCM assets and timely completion of tasks.
- Risk Directive CHARLIE: Primary concern is timely completion of task – risk to assets is secondary.

b. Full Mission Profile

The Full Mission Profile presented in Table as adapted to a generic UUV-N mission is presented in Table 7. The Predecessor Tasks and Neutralize phases were added to reflect the nature of the UUV-N mission, which relies on other systems to localize the contacts and requires an additional phase near the objective area (Neutralization).

Table 7. NSCT-1 Full Mission Profile Adapted to Generic UUV-N Mission

Phase	Action Conducted During Phase	Functionary
Predecessor Tasks	• Search, Locate, Classify, Identify: Select And Map Targets	•S-C-M, R-I UUVs •Divers •MMS
Insert	• Load-up • Depart Host Ship • Transit to Rendezvous Point	•Insert/Extract Craft •Security Escort
Infiltrate	• Launch UUV-N Operational Craft • Transit from Rendezvous Point to UUV-N Standoff Deployment Point	•UUV-N Operational Craft
Action on Objective	• Deploy UUV-Ns • Prepare for Neutralization Phase	•UUV-N Operational Craft •UUV-N Systems
***Exfiltrate**	• UUV-N Operational Craft Return to Rendezvous Point • Recover UUV-N Operational Craft	•UUV-N Operational Craft •Insert/Extract Craft •Security Escort
Neutralize	• Insert to Actuation Signaling Point • Deploy and Actuate Neutralization Signal(s) • Recover/Extract to Host Ship	•Insert/Extract Craft (w/ Signaling Equipment) •Security Escort
Extract	• Return to Host Ship	•Insert/Extract Craft •Security Escort

*This Phase may be eliminated upon further review of the operational requirements

c. UUV-N CONOPS

Table 8 presents the CONOPS by phase and sub-phase.

Table 8. UUV-N Phased CONOPS

Ref. No.	Phase or Sub-Phase	Action Conducted During Phase	Functionary(s)
1	**Predecessor Tasks**		
1.1	Search/ Locate/ Identify Targets	Targets are localized and mapped for neutralization	S-C-M, R-I UUVs MMS Assets
1.2	UUV-N Mission Prep	Equipment checked out and mission plans developed and loaded into consoles	All UUV Platoon Personnel
1.3	Load-up	Equipment is loaded into insertion/extraction craft in preparation for insertion phase	All UUV Platoon Personnel
1.3.1	Remove UUV-N from Magazine	UUV-N's are removed from the magazine in preparation for movement to insertion/extraction craft	NSCT-1 EOD Techs and host ordnance specs.
1.3.2	Transport to 11-m RHIB	Equipment is moved from magazine to insertion/extraction craft (11-m RHIB)	NSCT-1 EOD Techs and host ordnance specs.
1.3.3	Remove from Containers	UUV-N's are removed from shipping and storage containers	NSCT-1 EOD Techs only
1.3.4	Program UUV-N	UUV-N's are programmed with target information	NSCT-1 EOD Techs only
1.3.5	Load aboard 11-m RHIB	UUV-N's are loaded aboard 11-m RHIB for insertion	UUV Platoon personnel
2	**Insert**		
2.1	Launch	Insertion/extraction craft and escort 11-m RHIBs are launched from host (assume well deck)	Well deck personnel and UUV Platoon
2. 2	Transit to rendezvous Point	Insertion/extraction craft with operating teams and equipment, and escort craft, proceed to a rendezvous point at the shoreward edge of the permissive zone	Operating Team and 11-m RHIB crews
3	**Infiltrate**		
3.1	Transit to Standoff Deployment Point	11-m RHIB with operating team makes high-speed run to deployment point near operating area – escort may loiter at rendezvous point	Operating Team aboard 11-m RHIB
4	**Action on Objective**		
4.1	Deploy UUV-N	Operating team rapidly deploys UUV-N's at deployment point	Operating Team aboard 11-m RHIB

Table 8 UUV-N Phased CONOPS (Continued)

Ref. No.	Phase or Sub-Phase	Action Conducted During Phase	Functionary(s)
5	**Exfiltrate**		
5.1	Return to Rendezvous Point	Operating team makes high speed run to rendezvous point	Operating Team aboard 11-m RHIB
6	**Extract *This phase may be deleted upon further review of the operational requirements.**		
6.1	Return to Host	Insertion/Extraction craft and escort 11-m RHIBs return to host	Operating Team and 11-m RHIB crews
6.2	Recover	11-m RHIBs are recovered	UUV platoon and well deck crew
7	**Neutralize**		
7.1	Extract to Signaling Point	Insertion/Extraction craft and escort 11-m RHIBs extract to signaling point about 2500 m from furthest mine.	Operating Team and 11-m RHIB crews
7.2	Fire UUV-N's and Engage	Operating team deploys signaling equipment	Operating Team
7.2.1	Establish Communications with UUV-N	Operating team establishes communications with first UUV-N	Operating Team
7.2.2	Actuate	Operating team fires first UUV-N	Operating Team
7.2.3	Self-Navigate to Target Area	First UUV-N begins to navigate to furthest target – conducts GPS fixes en route	UUV-N Torpedo
7.2.4	Operator Assist Target Acquisition	On reaching target area, sonar activates and begins sending back data to operator – operator assist UUV-N in locating target via sonar	UUV-N and operator
7.2.5	Fire When Solved	UUV-N acquires target with good sonar fix and camera – operator evaluates and fires	UUV-N and operator
7.2.6	Repeat for Remaining UUV-N's	Sequence is repeated for remaining torpedoes	Operator
7.3	Exfiltrate/Extract	When all UUV-N's are fired, Exfiltrate/Extract Sequence is repeated	As above